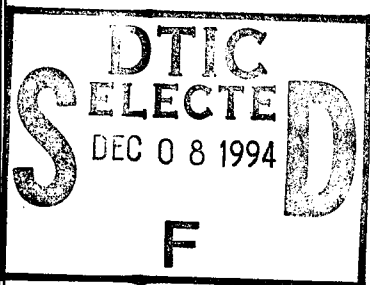


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Information Culture in DoD: Preparing For The Third Wave



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*Information Culture in DoD:
Preparing for the Third Wave*

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Abstract

Is the Department of Defense prepared to receive, process and share information according to the model of the information superhighway? If we are, how will the Department of Defense be changed by adopting the new information-*sharing* model over our current information-control? As our war-fighting model evolves from attrition warfare to information warfare (Alvin Toffler's "third wave" warfare), swift access to current, reliable information will become our most basic requirement. If we are to maximize future readiness and achieve the cost reductions promised from the information superhighway, the Department of Defense must make major cultural changes. We must achieve enterprise integration, embrace the culture of process improvement, and accept a radical reorganization in order to realize information superiority--and therefore military superiority--on the battlefield.

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Abstract

Is the Department of Defense prepared to receive, process and share information according to the model of the information superhighway? If we are, how will the Department of Defense be changed by adopting the new information-*sharing* model over our current information-control? As our war-fighting model evolves from attrition warfare to information warfare (Alvin Toffler's "third wave" warfare), swift access to current, reliable information will become our most basic requirement. If we are to maximize future readiness and achieve the cost reductions promised from the information superhighway, the Department of Defense must make major cultural changes. We must achieve enterprise integration, embrace the culture of process improvement, and accept a radical reorganization in order to realize information superiority--and therefore military superiority--on the battlefield.

Introduction

The "information superhighway" is all over the media; there are frequent reports in everything from the local evening news, to the Wall Street Journal and Popular Mechanics. The idea embodied in the term "information superhighway" is to build a means of communicating huge amounts of information quickly and accurately. The Department of Defense (DoD), arguably one of the largest producers and consumers of information in the country, has a vital interest in harnessing the power of electronic information, and therefore in the information superhighway. Consider this scenario:

In the midst of battle far from home, an Army tank breaks down. Its crew runs through the tank's **on-board diagnostic program** and finds a temporary repair. The same **intelligence link** that had helped the tank commander fight, now shows him the best route to safety and notifies the battle commander of his status.

With a single button, the tank commander transmits information about the temporary repair as he moves to a nearby **logistics** base. Support personnel there screen not only in-theater assets, but the entire "inventory in motion" stream of parts in shipment. When the needed part is received (in hours instead of days), a maintenance crew replaces the part using an up-to-date **repair procedure** read from the headband mounted display of a voice-directed computer. The computer also updates the tank's **maintenance history** and documents parts usage, again

based on voice commands while maintenance is in progress.

The tank and its crew rejoin the battle, while the failed part is being repaired. The forward logistic base **screens in-theater repair capability and capacity**. Through another communications link, the joint task force staff instructs the logistics base to ship the part to the aircraft carrier offshore. The personal computer that prepares the **electronic shipping tag** simultaneously sends a message to the carrier that the part is enroute.

Navy repair personnel immediately review **technical data** held onboard. They need three more detail drawings. Via satellite, they request and receive the drawings from the **Integrated Weapons Systems Data Base**. When repairs to the tank part are complete onboard the carrier, the part's storage location in the carrier's storeroom and its status are entered into the **asset management system** by scanning its original electronic shipping tag.

Reviewing usage data, the tank logistic support analyst at headquarters sees that the computer has updated the **number of spares** carried in the system for this part. She notifies the tank's system engineers of the high usage, so they can find and **prevent future failures**.

The scenario has enormous appeal. But is the Department of Defense prepared to

receive, process and share information according to the model of the information superhighway? If we are, how will the Department of Defense be changed by adopting the new information-*sharing* model over our current information-control? As our war-fighting model evolves from attrition warfare to information warfare (Alvin Toffler's "third wave"¹ warfare), swift access to current, reliable information will become our most basic requirement. Information allows warriors to win battles, commanders to protect the safety of their subordinates, the military to avoid fielding a "hollow force" in an era of massive budget cuts, and leaders to enhance the job satisfaction of civilian employees. DoD--principally the uniformed services, the Defense Logistics Agency, and the Defense Information Services Agency--must find systems and strategies that will let us exploit the information infrastructure being developed by private industry. If we are to maximize future readiness and achieve the cost reductions promised from the information superhighway, the Department of Defense must make major cultural changes. We must begin now, in advance of the superhighway's existence. We must achieve enterprise integration, embrace the culture of process improvement, and accept a radical reorganization in order to realize information superiority--and therefore military superiority--on the battlefield.

Enterprise Integration

An "enterprise" may be either a single business organization or any systematic purposeful activity. Enterprise integration refers to linking parts of the organi-

zation or activity via a common digital database, in real time. The purpose of enterprise integration is to examine every step in the process of developing a product--from initial idea, through design, manufacture, distribution, and life cycle support--with an eye toward deleting any step that doesn't add value. The common database allows product information to be entered once, then used many times by a variety of people throughout the enterprise. All of the enterprise's people need to understand how the parts of the enterprise fit together to deliver a high value product.

In defense, the product is warfighting capability. Any effort that does not support soldiers, sailors, airmen and marines in battle is recognized as wasted energy. Obviously, the enterprise integration description above applies to the manufacture of the weapons systems for use by fighting forces. What's less apparent is how it applies to the operational forces. In business, enterprise integration eliminates stovepipes, or divisions, that may be internally efficient but are inefficient in delivering the final product to the customer. In warfighting, delivery of a product to the customer means power projection. Eliminating stovepipes requires examining how and why this country employs its military forces, and removing any self-imposed internal limitations to achieving those missions. Operational processes--the "tooth" of the military beast, and the product of the military enterprise--must be examined first. Only when military operations have been modeled, understood, and simplified can the military support functions (the "tail") be blended in appro-

priately.

Integrating Defense information

One of the most important operational processes is the flow of information to battlefield commanders, other warfighting decision-makers, and individual members of the fighting forces. As stated in material describing the Joint Staff's (J-6) "C4I* for the Warrior" concept, each of these "Warriors" needs a

fused real time, true representation of the (. . .) battlespace--an ability to order, respond and coordinate horizontally and vertically to the degree necessary to prosecute his or her mission in that battlespace.²

The JCS' vision is directly comparable to the information superhighway vision of the private sector. Strategies that will achieve the C4I for the Warrior objective of a Global Command and Control System (GCCS) will also achieve enterprise integration by locking the focus on our warfighting product. GCCS will incorporate operational processes through its crisis planning, force deployment, employment, status, air operations, fire support, intelligence, and position functions. Support functions, such as logistics and personnel, will be blended in only to the extent that operational Commanders in Chief deem necessary.

*Command, Control, Communications, Computers, and Intelligence

Meanwhile, major logistic information systems--growing independently of the GCCS warfighting initiative in the J-6--are consuming significant resources. Most visible of these is JCALS, the Joint Computer Aided Acquisition and Logistic Support system. Launched as an Army program in 1987, JCALS is one of the "flagship" programs under the DoD CALS (Continuous Acquisition and Life Cycle Support)³ initiative.

As the names indicate, both the DoD CALS initiative and JCALS, its lead program, are an outgrowth of the need to streamline the acquisition process in the Defense Department. Acquisition reform is imperative in order to make maximum dollar resources available to warriors and ensure that new equipment is fielded quickly enough to provide a technological advantage over potential adversaries. But acquisition reform in itself does not generate improvements to the Defense product, namely, *warfighting* capability.

Given roughly similar equipment on both sides of a battle, not even the most sophisticated acquisition system will help a tank commander win once he's in battle. Worse, the JCALS program cannot even claim to be a sophisticated acquisition system. The program is authorized only to produce technical manuals to the "ready to print" stage. It does not provide a finished product to a user such as a mechanic or engineer, nor does it currently include any other functions. Deployment of the system to 400 sites will begin in 1995 and not be completed until 2000.

Future functions planned for the program include pricing, cataloging, configuration management, and other acquisition-specific topics. There is no planned future integration of warfighting functions into the JCALS system.

As noted above, the "C4I for the Warrior" concept (referred to hereafter as "C4I") *does* include a logistics function, which has not yet been specified. Why not make JCALS a module of C4I? The obstacles to a JCALS/C4I merger lie in the two programs' utilization of time and money. Despite nearly seven years of effort and an expenditure of \$88 million, the JCALS program so far has fielded only five prototype systems. C4I, on the other hand, "declared victory" in its near term phase after spending only nine months and \$5 million. What's the difference?

The JCALS program strategy, nominally "evolutionary" in the sense that more modules will be added after the basic system is deployed, has so far proceeded as a classic "grand design" system. A grand design system seeks to present a complete solution to the problem, or "mission need." Under standard acquisition rules, it's also a system that demonstrably fills a need where nothing else exists. Grand design systems, which start from scratch and aim at 100 percent success, are huge consumers of time and resources. Projecting costs through 2007, JCALS--a program to write technical manuals--will cost about \$2.2 *billion* dollars, or more than the nearly \$1.9 billion price of a Trident II submarine.⁴

C4I, on the other hand, uses a completely different strategy. It selects from among smaller existing programs, knitting them together and making small improvements in the "best of breed" systems. This "modular" approach doesn't cost a lot of money, so it doesn't reach the major program thresholds defined in DoD Instruction 5000.2. And costs stay small. The program doesn't have to spend money to generate the extensive documentation required for 5000.2 oversight. C4I never needs to prove that it is filling an unmet need, so it doesn't need to strive for 100 percent complete solutions. Instead, C4I can quickly and economically achieve a program that reaches an "80 percent" solution. Never perfect, it is almost always good enough. More important, C4I is in the hands of users virtually instantaneously.

The C4I strategy of adopting "best of breed" solutions and merging them onto an existing base makes an eventual merger with JCALS unlikely. JCALS is not yet fully developed, and it has only limited functionality. Other logistic information systems, which *do* support the warrior and provide a much broader range of functionality (like the Joint Maritime Command Information System) already exist. One of these proven systems is much more likely to become the basis of the GCCS logistics module than is JCALS.

If JCALS is ever to justify its immense cost (the Program Manager projects benefits of only \$1.6 billion, a shortfall of over \$500 million when compared to costs over

the same period), it must grow toward incorporation in the GCCS. The Integrated Weapons Systems Data Base, arguably the heart of the JCALS program, offers tremendous potential benefits to warriors and logisticians alike. It provides the opportunity to enter weapons systems data once, during acquisition, and use it many times throughout the life cycle, including on the battlefield. If JCALS can coordinate future program development with the C4I architects (and they should start *now*), speed up adding additional functions so that the system is not obsolete before it's fielded, and minimize future costs, it could become a valuable module of the GCCS. If JCALS cannot be meshed with GCCS, it is duplicative of the future GCCS logistics function, does not support the fighting forces product, and represents a significant waste of Department resources.

The C4I Global Command and Control System vision offers an affordable, timely plan to achieve enterprise integration throughout the Department of Defense. Customer-driven and unwavering in its focus on the primacy of the warfighting product, it should become the standard by which to judge other information systems as they compete for DoD resources.

Process Improvement

New technology, and especially a new information system, holds the promise of major efficiencies. And it's true that in some cases buying a new machine does result in savings. But the real gains in productivity happen not as a result of

technology, but from people thinking about how they work and then making improvements in the work process. It helps to have a framework for doing this thinking: in DoD, the framework is the Corporate Information Management (CIM) initiative. Launched in 1990, CIM's goal was to overhaul the Department's way of managing business information. The CIM approach--nominally ongoing as of this writing--has much to recommend it, but it is also seriously flawed.

Corporate Information Management (CIM)

CIM's first principle is that information management rests on a foundation of well-understood business processes. It does not seek to reform organizations by reforming their computer systems. Instead, CIM shares with Total Quality Management (TQM) the idea that if managers understand processes, then the proper role for automated information systems will become clear.

CIM requires simplification of Defense business processes by eliminating steps that add no value. Any process is likely to include steps that have been inserted over time in response to the organization's structure and the priorities of the moment. Process simplification takes a ruthless look at each step to evaluate whether tangible or intangible benefits (such as safety) are added. Managers eliminate, consolidate, or update steps that accomplish little or nothing, to speed the process toward the product. Automation, a powerful tool for increasing the rate of a process, is applied only after weighing its cost (now and in the future) against its

benefit. The process evaluation and improvement methods shared by CIM and TQM are vital to preparing the DoD to use the information superhighway. Thomas Davenport notes:

The presence of technology, in and of itself, cannot wholly change a corporation. Changing a company's information culture requires altering basic behaviors, attitudes, values, management expectations, and incentives that relate to information.⁵

CIM and TQM are the tools that will enable DoD to modify those aspects of the American military culture that will inhibit our effective use of information technology as a productivity catalyst.

But CIM is flawed in two respects. First, it extends only to support or "tail" functions, not the "tooth" that is the chief DoD product. Paul A. Strassman, a key member of the Executive Leadership Group (ELG) which formulated the plan for CIM directions and delivered it to the Secretary of Defense (then Mr. Cheney), has noted that

Every text book on information management asserts that unless you proceed with the design of systems starting from the "customer end" inwards to the "back office," you will end up with a defective design.

The charter of the ELG was nonetheless clear: concentrate on the "back office," do not touch C3I and make sure that finance and accounting remain the priority⁶.

Enterprise integration--support of the fighting forces--was omitted from the CIM strategy, apparently against the better judgement of the business professionals named to the ELG.

Second, CIM insists on the elimination of "duplicate" information systems without allowing time to change the underlying business processes in different organizations. Granted, the Navy's NALCOMIS^{*} and MRMS^{**} systems *are* duplicative in function, since both manage maintenance actions, the first for the naval aviation community and the second for ships. By eliminating one (not to mention eliminating other similar systems in the Army and Air Force) it's possible to save all the costs associated with keeping the cancelled program current, such as updating it for new hardware, streamlining processes, or writing new code to add features. The problem is that while the functions are the same between aviation and surface ship maintenance, the underlying philosophy and most all the processes are different. So it's *not* efficient to just kill one program and move the other one in,

^{*}Naval Air Logistics Command Management Information System

^{**}Maintenance Resource Management System

since the new program won't fit the old processes. Programs that don't fit aren't used. And while the costs of maintaining the cancelled information system may be saved, the costs of doing a process with a poorly fitted information system skyrocket.

So how should the Department approach process improvement? Six areas are critical:

- Expand the CIM charter
- Simplify CIM processes
- Consolidate information strategy leadership
- Train the users
- Accept less than perfection
- Allow time for change

Expand the CIM charter

First, expand the CIM charter to encompass the warfighting processes that are the DoD product. In fact, CIM, as applied to the operating forces, should take precedence over other information initiatives. Information systems are a waste of time and resources to the extent that they do not directly support the operating forces by enhancing "the capability of the Warrior to respond and coordinate horizontally and vertically to prosecute effectively and successfully any mission in the Battlespace."⁷ Adoption of CIM implies that TQM (by whatever name it is called

among the various services) will also be an integral part of the operating--not just the support--forces.

Simplify CIM processes

Next, simplify the CIM processes themselves. More to the point, simplify information system acquisition processes. Both CIM and the Major Automated Information Systems Review Council (MAISRC) "belong" to the Assistant Secretary of Defense for Command, Control, Communications and Intelligence (ASD(C3I)). Both have extensive documentation requirements. Unfortunately, there is little overlap in those requirements. Although it seems a simple matter for the ASD to direct his subordinates to merge the requirements, part of the problem is the disparity in the underlying assumptions in the two approaches. CIM requires simplification and supports building on what already exists. The MAISRC process is best suited to a "grand design" approach, as discussed in the case of JCALS (p. 7). The most appropriate solution is to make the MAISRC process the exception rather than the rule by revamping DoD expectations for information systems. If we accept the logic of CIM, then the "classic" MAISRC process must become a relic of the past.

Why? The MAISRC process is based on the expectation that information systems will be large, high cost, and therefore high risk projects.⁸ It is a good tool (which with some modification could become an excellent tool) for controlling a program based on a "grand design" strategy. But a grand design program is a bad fit for the

needs of a dollar-poor, information-rich, information-*hungry* military. Grand design programs attempt to solve big problems by spending big dollars to build big programs. The difficulties are obvious. Big dollars aren't there anymore. Big programs take a long time to reach users: remember JCALS has only five prototype systems fielded after seven years. By the time big systems can reach users, computer technology has passed them by. Meanwhile, users are either still suffering with the problem that gave rise to the big program, or (more likely) they've developed "band-aid" systems themselves, using what resources they could scrounge.

The Department of Defense needs information systems that are quick, cheap solutions to small problems, which *in aggregate* solve the big problem of interoperability. Small systems solving small problems comply with CIM doctrine, which mandates evolutionary, incremental systems deployment and use of off-the-shelf hardware and software.

Since a small (say, five million dollars or so) program doesn't qualify as a "major" system, the DoD oversight process doesn't cover it. In fact, the sponsoring service might review a five million dollar program only at the major command level. How can we keep from having lots of small programs that don't add up to anything, and as such, don't meet the interoperability requirements of the joint warrior? Instead of reviewing single programs, the MAISRC should be re-chartered to review the *total* service information resource picture. Each service's senior official

responsible for information management already monitors his own programs.

Twice a year, the MAISRC could convene a meeting of these senior officials. Each would present the spectrum of programs under his purview, describing how each program supports the overall goal of interoperability (or why it is service unique).

This senior level meeting forces a preliminary working level meeting, during which the richest benefits of this strategy would be realized. Working level representatives could share knowledge and devise ways to link their efforts. They would be motivated to find these links because programs that demonstrate jointness would be rewarded by the MAISRC with continued funding. The MAISRC would look most favorably on high value-added programs--most likely those based on off-the-shelf software.

Under this scheme, DoD instructions must be revised to dramatically simplify the documentation needed for small, cheap programs.⁹ The idea is to *reward* programs--and program managers--that husband scarce resources and favor interoperability. The MAISRC can guide information systems in this direction, but only if it has a way to see the full range of service initiatives, as opposed to just seeing the big, expensive ones. It must also retain the "big stick" of arduous formal review of major programs. The most stringent requirements should be at the early milestones, at which program advocates must prove why a major program would be a more economical approach than a series of small solutions.

Consolidate information strategy leadership

Third, information strategy leadership should be consolidated to eliminate competing agendas (that is, between acquisition and warfighting information systems) in support of the goal of seamless information availability within the Department. As noted above, CIM is within the purview of ASD (C3I). The Director, CALS and Electronic Data Interchange, who reports to the Principal Deputy to the Undersecretary of Defense (Acquisition and Technology), oversees CALS strategy for the Department of Defense. The Joint Staff sponsors C4I for the Warrior. Ideally, I would combine the information strategy and systems portions of these three unrelated offices under the aegis of the Joint Staff (specifically the J-6, responsible for command, control, communication and computer systems), because of the three they are the closest to the warfighting customer. But in practical terms, such a combination is unworkable because of limitations on the size of the Joint Staff. Instead, I would insist that information policy-making be the prerogative of the Joint Staff, while the staff functions of the other two offices should be combined under ASD (C3I). CIM's mission should be expanded to include both warfighting and the revised information system oversight processes, while CALS should retain its industrial base focus.

Train the users

For information tools to be of any real benefit to users, they must fit real needs. Both warriors and those who support them can use the methods of TQM to

discover, validate, and communicate their needs. Training in the logic and methods of TQM must be given to all personnel, beginning very early in their careers. Through a shared TQM "vocabulary", eventually all Defense employees will understand both the relationship of their mission to the Department's total warfighting product, and the importance of continuous improvement to conserve scarce public resources.

Accept less than perfection

Even perfectly fitted information tools are worthless until they are bought and delivered. Perfect tools are expensive and time-consuming to build. The "good enough" or "80 percent" solution that's in use is far better than the promise of an ultimate system that may or may not ever be funded for development. Once a culture of continuous improvement is in place, there is little need for information systems to aspire to perfection. The concept of "build a little, test a little, field a lot" is fundamental to C4I for the Warrior. It lets the users describe what their information system should do. As they live with early versions, users send comments back to the system managers, who can then invest resources in on-target improvements. The same system of user-manager communication identifies, validates and swiftly incorporates new requirements. Since information technology capability improves--and prices fall--so fast, getting "80 percent" systems fielded rapidly makes more sense than waiting years for a system that is well past both state-of-the-art and market cost when it finally arrives.

Allow time for change

The last impediment to accepting the culture of process improvement stems from the pressure to cut spending. Lately, good ideas have resulted in immediate budget marks without sufficient--indeed, hardly any--time to think them through. In a recent interview, a senior officer said the reorganization he was working on sounded like a good idea. Unfortunately, a compelling budget mark was taken *before* any study or discussion. That means that although the appearance of consensus and TQM will be observed, all his office will have time for is to just "do what *we* want." Short term savings will probably accrue. Long term, however, the disruptions resulting from the proposed sweeping reorganization will "cost" additional savings as the organizations involved make inefficient adjustments to hasty changes. At this point in the history of Defense funding, it's unrealistic to think that the budget process will allow us to change at a comfortable pace. Big changes *will* happen fast. It's imperative, though, to invest sufficient time in *planning* the change. Affected organizations must have time to commit to the new way of doing business if maximum benefits are to be reaped. There are no rewards for saving \$175 million if a \$200 million improvement was expected, since the \$25 million shortfall will have to be taken from another tightly budgeted program.

By devoting attention (few dollars are required) to reforms and improvements in these six areas, the Department of Defense can "prepare the ground" for the effective implementation of new information technology.

Defense Reorganization

Actually adopting enterprise integration and the culture of process improvement (as opposed to just writing policy and instructions), can only occur in parallel with a radical restructuring of the Department of Defense. Rigidly vertical--and often one-way--lines of communication will be forced to give way to communications networks, in which information moves in many directions simultaneously.

The Air Forces's Integrated Product Teams (IPTs) foreshadow this reorganization. IPTs are the result of new thinking in the Systems Program Offices, which are responsible for specific aircraft such as the B-2 or F-22. The IPTs are integrated, cross-functional teams that focus on a product within the aircraft, such as the wing or the avionics. Team members have backgrounds in contracting, engineering, management, finance, training, manufacturing, logistics, and testing. Under the old organization, work groups shared similar skills--contracting, for example--but worked on the entire plane. Contracting decisions were based on legal considerations; engineering decisions were based on technical criteria. But now the team has the expertise to make engineering decisions in light of their impact on the contract, or discuss contracting strategy in terms of its manufacturing consequences. An IPT judges every decision on its effect on the product *as a whole*, not just within a narrow discipline. In a significant departure from previous practice, the IPT--the lowest level--makes decisions, then informs senior management. The program

manager, freed from having to make virtually all decisions on the project, spends his time getting external resources for the IPTs, instead of arbitrating internal conflict between work groups. His function has shifted from "boss" to guide, resource, and facilitator. The most important information paths are horizontal, between team members or teams, rather than vertical, from subordinate to supervisor.

Changing the face of battle

But IPTs are part of the support "tail." Departmental enterprise integration must focus on the total Defense product: warfighting capability. In the future, individual soldiers, sailors, airmen, or marines, will deliver that product, as always. The difference that enterprise integration and the culture of process improvement will make is that now this warrior will be "empowered." He or she will still be on the battlefield at war, but will no longer be just the recipient of orders.

The individual warrior, a product of months or years of training, will become what TQM creates: an active participant in the decision making process. Individual warriors will no longer be expendable units in a war of attrition. They will become critical intelligence gatherers and sharers in a war of information. Since the entire force will be linked electronically, orders will be instantaneously received--*exactly as they were transmitted*--by each individual. With the same speed, individuals in the force will return constraints on executing those orders, or new information, to

the commander. The commander will have a virtually complete picture of the battlespace, in real time, as data is received not only from each of the component forces, but from individual warriors or small groups.

How does the presence of this empowered warrior change the face of battle? In manufacturing, empowerment means the individual worker has authority to stop the entire production line. How does a similarly important warrior change the relationship between the commander and the field? Surely the model of reflexive obedience to orders is affected.

Although the technology to process and render accessible to human understanding the huge volume of information implicit in the battlefield scenario above does not yet exist, it almost certainly will be commonplace within fifteen to twenty years. Today's junior officers and enlisted will be leaders in an information-saturated environment. What must we begin to do today, so that in fifteen years these young service men and women will arrive at the peak of their careers with the skills and relationships in place to exploit the power of information in battle? Our priority should not be on building the information systems themselves, but rather on reshaping Department of Defense organization and culture.

Shifting from a pyramid to a web

The DoD's fundamental structure must change from a hierarchical pyramid to one

of overlapping circles. Air Force IPT organizational charts are drawn with circles showing the teams and their relationships. But mere circles are not enough. The circles must *overlap*, as teams share members and rotate between functions. A business leader characterized by Peter Drucker as "perhaps the best professional manager in America," guides a management structure that places the leader at the center, not at the top, of a wheel or *web* shaped chart. Most of those management jobs rotate every two or three years, supporting functional overlap as managers learn the strengths and problems of different divisions. Cross divisional teams form as needed to execute specific projects, then disband. As overlapping circles connect to form an organizational web, the image is one of inclusion, of seeing the organization as a connected whole, with no part separable or independent of another.¹⁰

A web-like organization is essential in an information-saturated environment. It facilitates information exchange by eliminating the single, strictly vertical, chain of command channel. Instead, information can spread easily throughout the organization via multiple paths. Seniors and subordinates become partners, sharing information to solve problems, accomplish goals, and most important, improve the product. Sharing information mitigates fear among members of the unit, again allowing emphasis on product improvement. Discipline, once based on the coercion implicit in a hierarchical power structure, becomes a function of commitment to the unit resulting from full participation and "ownership" by its members.

To a certain extent, military assignment policies already support the web or overlapping circles organizational model. As individuals progress through their careers, they move frequently, and so learn how a variety of units solve similar problems. But much more could be done. We have exchange programs between officers of US and foreign militaries in order to build bridges of understanding between cultures. We should expand officer and senior enlisted exchange programs *between services* to build equally important bridges, wherever career fields are similar enough for this to be fruitful for both the individual and the services.

Where permanent cross-service tours are not feasible, commanders of facilities near each other should make opportunities for short-term cross training between services and specialties. For example, there is virtually no knowledge of naval aviation maintenance philosophy, organization, or procedures among surface ship maintainers, despite the geographic proximity of many of those facilities. Mid-tour visits between these facilities, after officer and enlisted personnel have become thoroughly familiar with their own procedures, could result in an exciting exchange of ideas, improvements, and challenges.

The consolidation between services of similar skills training facilities, although undertaken for budgetary reasons, will provide unsought benefits because they will train not only skills but joint warriors. "Jointness" may not be part of the

formal curriculum, but it will be an inescapable consequence of having classmates from different services in contact with one another.

Skill and other training must support empowered warriors. Our earliest leadership models come from classrooms. Ideally, in order to wind up with empowered individuals, elementary school education should begin the pattern by allowing students greater autonomy. But since there is no mechanism within DoD (or in truth, anywhere in the Federal government) to change the educational philosophy of thousands of local school districts, the Department of Defense must at least ensure that its own training fosters student initiative and responsibility. Teachers should strive to be "the guide on the side" rather than "the sage on the stage." Students should learn by doing. Students should learn in groups. Group achievement should be more highly valued than individual achievement. Initiative *on behalf of the group*, responsibility *to the group*, and the creative use of the teacher as *one among many resources*, would turn classrooms from models of hierarchy to rehearsals of information sharing.

A strategy of action

How else should the DoD be restructured to prepare for information-saturation? It's difficult to know precisely what structures will serve us best in an unknown future. Margaret Wheatley reports organizational theorist Karl Weick's approach:

'Acting should precede planning . . . because it is only through *action and implementation* that we *create the environment*. Until we put the environment in place, how can we formulate our thoughts and plans? In strategic planning, we act as though we are responding to a demand from the environment, but in fact, . . . we create the environment through our own strong intentions. Strategies should be . . . supported by more investment in general knowledge, a large skill repertoire, the ability to do a quick study, trust in intuition, and *sophistication in cutting losses*.' In other words, we should concentrate on creating organizational resources that continue to expand in potential until needed. [All emphasis added.]¹¹

This kind of action strategy is very nearly what J-6 and C4I for the Warrior achieve when they advocate "build a little, test a little, field a lot." While their vision is constant, the strategy itself is fluid, and depends on feedback from users in the field. The "right" Departmental reorganization will emerge as we field information technology, and listen to those who use it.

For example, the Navy's "CALS to the Deckplates" project seeks to put electronic tools in the hands of the Fleet by sending a variety of products to sea with the USS CARL VINSON Battle Group beginning in January 1994. It will be difficult to measure the effectiveness of the VINSON project. Full utilization of electronic tools

depends on having a culture that incorporates them in place. For example, VINSON will hold electronic copies of all technical manuals for the six ships in her Battle Group. The proposed measure of effectiveness will count how many times those manuals are used. But since no aircraft carrier has ever deployed with all the battle group's technical manuals--electronic or otherwise--it won't be habit for the accompanying ship's crews to send repair work to the carrier. Accompanying ships will send some work, of course, but the volume of interaction within this initial Battle Group will be much less than what will become the norm after several deployments. Until sailors have used the tools, learned from them, and adapted their procedures to incorporate them, it will be impossible to declare them effective, or tell what sort of organization is the best climate for using them. For the present, it may be enough to identify those sailors who really enjoyed or really hated the electronic products. Evaluators should interview them to find out how to expand or correct the tools.

But the tools themselves are almost self-evidently valuable; for example, every part of each ship's maintenance organization will rejoice when they see the first products of the automated preventive maintenance scheduler. So effectiveness is only the first, and less important question. The real question is to ask what having the electronic tool changes--what connection or relationship is now visible that was hidden before CALS to the Deckplates, and how can this new knowledge improve accomplishment of the ship's warfighting mission. Again, the sailors and officers

who had the deepest involvement with the electronic tools, be it love or loathing, will be the best source of information about how to organize to exploit electronic information in future battle groups.

Conclusion

The DoD will adopt information strategies that are compatible with the information superhighway. There is no technical obstacle to doing so, and there are several other factors that push us in that direction. The most significant of these is the opportunity to match the US industrial base in its information techniques. But we will not reap the full benefits of information power until we understand

- how to integrate Departmental stovepipes to enhance the warfighting product,
- how to share information to improve our operational and administrative processes, and especially,
- how to execute command and control in an environment of "empowered" military forces.

A "third wave", information-based military model will force us to recognize the fundamental importance of human beings, even as more and more machines enter the battlespace.

If we are not willing to accommodate the changes demanded by the new information-fueled, people-centered model, we will be swamped by the flood of infor-

mation we will generate. The technology promised as a force-multiplier will become a force-divider. We will be surprised by our grievous losses to sophisticated enemies who *have* incorporated the lesson that information is valuable only to the extent that it enhances human intelligence and supports human processes. We will be stunned by our losses to unsophisticated enemies whose information systems, although primitive, match their organizational processes.

Notes

1. Toffler, Alvin, and Heidi Toffler, *The Third Wave* (New York: Bantam, 1980). Also *War and Anti-War* (Boston: Little Brown, 1993).
2. The Joint Staff (J-6), "*Committed, Focused, and Needed*": *C4I for the Warrior* (Arlington, Virginia: 12 June 1993), p. 4.
3. First known as Computer Aided Logistics Systems, then re-named Computer-aided Acquisition and Logistic Systems, its name was last updated in the Fall of 1993.
4. JCALS cost in FY 94 constant dollars. The unit cost of a Trident II submarine was about \$1.5 billion in FY 1988 dollars. \$1.5 billion 1988 dollars equates to nearly \$1.9 billion 1994 dollars. JCALS cost cited in the briefing presented by Dr. James E. Tomlinson, JCALS Program Manager, as part of the OSD Decision Review, 9 Nov 1993. Trident cost from Jacques S. Gansler, *Affording Defense*, (Cambridge, Massachusetts: Massachusetts Institute of Technology Press, 1989), p. 170.
5. Thomas H. Davenport, "Saving IT's Soul: Human-Centered Information Management," *Harvard Business Review*, March-April 1994, p.120.
6. Remarks at the Fourth Armed Forces Communications and Electronics Association Computing Conference, 3 Feb 1993. Mr. Strassman was also formerly Director of Defense Information and Principal Deputy Assistant Secretary of Defense for Command, Control, Communications, and Intelligence.
7. The Joint Staff (J-6), *C4I for the Warrior*, p. 2.
8. Although instructions *allow* other types of development, the "classic" development strategy is the "grand design".
9. For example, test and evaluation is an area ripe for reform in the case of small information systems. Is it really be necessary to put a program on the test schedule 23 months in advance of the projected test date if program development (inception to deployment) is only 6 - 9 months? And does a program built on off-the-shelf software need to be tested with the same degree of rigor as one built on original code?
10. Helgesen, Sally, *The Female Advantage* (New York: Doubleday Currency, 1990), pp. 43 - 49. The business leader is Frances Hesselbein, National Executive Director of the Girl Scouts of the U.S. A., a non-profit organization of more than three million members.

11. Wheatley, Margaret J., *Leadership and the New Science* (San Francisco, CA: Berrett-Koehler Publishers, Inc., 1994), p. 37.